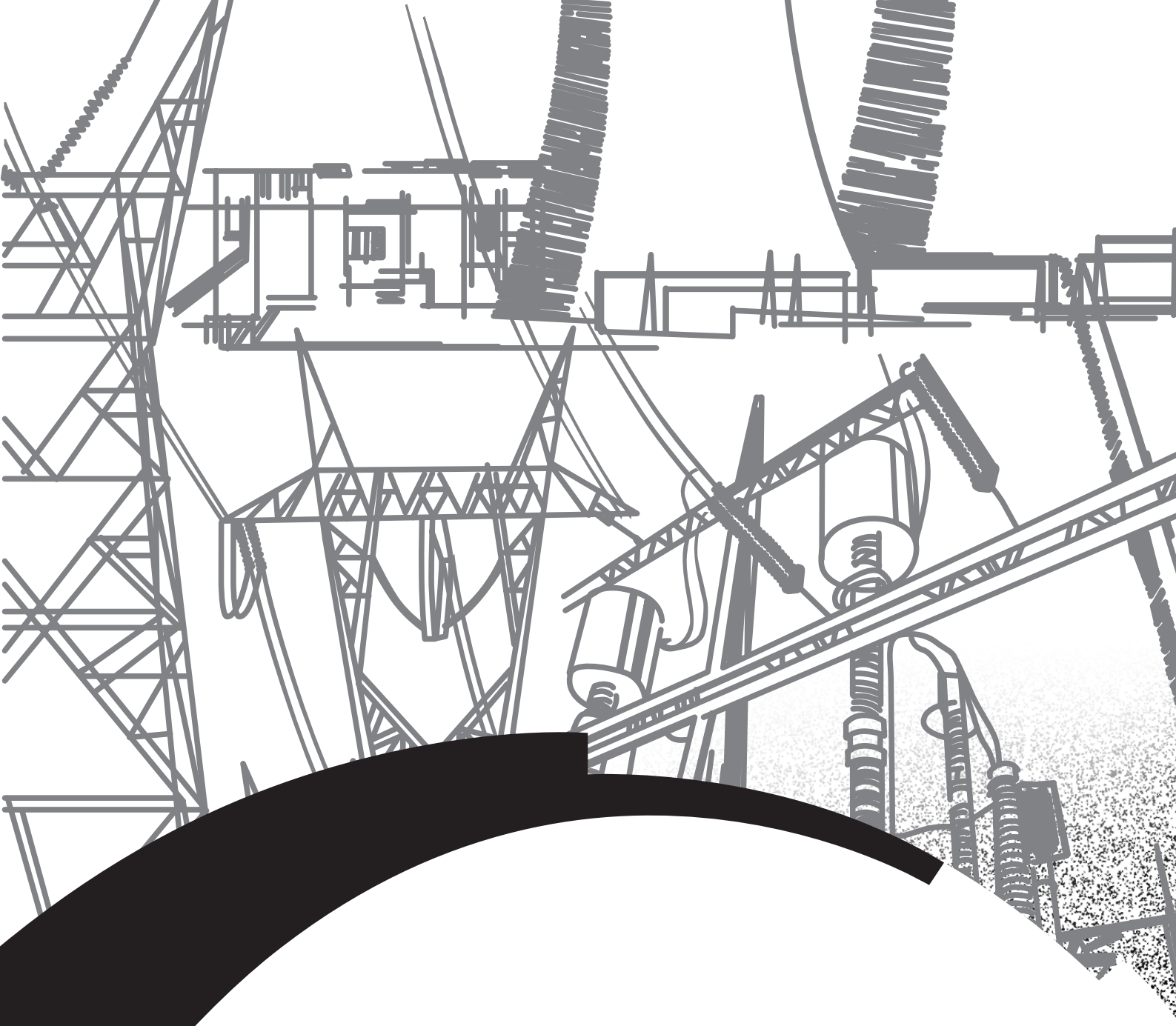

Service Manual

Type MVTI
Instantaneous Voltage Relays

ALSTOM

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HANDLING OF ELECTRONIC EQUIPMENT

A person's normal movements can easily generate electrostatic potentials of several thousand volts. Discharge of these voltages into semiconductor devices when handling electronic circuits can cause serious damage, which often may not be immediately apparent but the reliability of the circuit will have been reduced.

The electronic circuits of ALSTOM T&D Protection & Control Ltd products are completely safe from electrostatic discharge when housed in the case. Do not expose them to the risk of damage by withdrawing modules unnecessarily.

Each module incorporates the highest practicable protection for its semiconductor devices. However, if it becomes necessary to withdraw a module, the following precautions should be taken to preserve the high reliability and long life for which the equipment has been designed and manufactured.

1. Before removing a module, ensure that you are at the same electrostatic potential as the equipment by touching the case.
2. Handle the module by its front-plate, frame, or edges of the printed circuit board. Avoid touching the electronic components, printed circuit track or connectors.
3. Do not pass the module to any person without first ensuring that you are both at the same electrostatic potential. Shaking hands achieves equipotential.
4. Place the module on an antistatic surface, or on a conducting surface which is at the same potential as yourself.
5. Store or transport the module in a conductive bag.

More information on safe working procedures for all electronic equipment can be found in BS5783 and IEC 60147-0F.

If you are making measurements on the internal electronic circuitry of an equipment in service, it is preferable that you are earthed to the case with a conductive wrist strap.
Wrist straps should have a resistance to ground between 500k – 10M ohms. If a wrist strap is not available, you should maintain regular contact with the case to prevent the build up of static. Instrumentation which may be used for making measurements should be earthed to the case whenever possible.

ALSTOM T&D Protection & Control Ltd strongly recommends that detailed investigations on the electronic circuitry, or modification work, should be carried out in a Special Handling Area such as described in BS5783 or IEC 60147-0F.

ALSTOM

TYPES: MVTI 11 Static Modular Instantaneous Undervoltage Relays
MVTI 12 Static Modular Instantaneous Overvoltage Relays

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This Safety Section should be read before commencing any work on the equipment.

Health and safety

The information in the Safety Section of the product documentation is intended to ensure that products are properly installed and handled in order to maintain them in a safe condition. It is assumed that everyone who will be associated with the equipment will be familiar with the contents of the Safety Section.

Explanation of symbols and labels

The meaning of symbols and labels which may be used on the equipment or in the product documentation, is given below.

Caution: refer to product documentation

Caution: risk of electric shock

Protective/safety *earth terminal

Functional *earth terminal.
Note: this symbol may also be used for a protective/ safety earth terminal if that terminal is part of a terminal block or sub-assembly eg. power supply.

*Note: The term earth used throughout the product documentation is the direct equivalent of the North American term ground.

Installing, Commissioning and Servicing

Equipment connections

Personnel undertaking installation, commissioning or servicing work on this equipment should be aware of the correct working procedures to ensure safety. The product documentation should be consulted before installing, commissioning or servicing the equipment.

Terminals exposed during installation, commissioning and maintenance may present a hazardous voltage unless the equipment is electrically isolated.

If there is unlocked access to the rear of the equipment, care should be taken by all personnel to avoid electric shock or energy hazards.

Voltage and current connections should be made using insulated crimp terminations to ensure that terminal block insulation requirements are maintained for safety. To ensure that wires are correctly terminated, the correct crimp terminal and tool for the wire size should be used.

Before energising the equipment it must be earthed using the protective earth terminal, or the appropriate termination of the supply plug in the case of plug connected equipment. Omitting or disconnecting the equipment earth may cause a safety hazard.

The recommended minimum earth wire size is 2.5 mm^2, unless otherwise stated in the technical data section of the product documentation.

Before energising the equipment, the following should be checked:

Voltage rating and polarity;

CT circuit rating and integrity of connections;

Protective fuse rating;

Integrity of earth connection (*where applicable*)

Equipment operating conditions

The equipment should be operated within the specified electrical and environmental limits.

Current transformer circuits

Do not open the secondary circuit of a live CT since the high voltage produced may be lethal to personnel and could damage insulation.

External resistors

Where external resistors are fitted to relays, these may present a risk of electric shock or burns, if touched.

Battery replacement

Where internal batteries are fitted they should be replaced with the recommended type and be installed with the correct polarity, to avoid possible damage to the equipment.

Insulation and dielectric strength testing

Insulation testing may leave capacitors charged up to a hazardous voltage. At the end of each part of the test, the voltage should be gradually reduced to zero, to discharge capacitors, before the test leads are disconnected.

Insertion of modules and pcb cards

These must not be inserted into or withdrawn from equipment whilst it is energised, since this may result in damage.

Fibre optic communication

Where fibre optic communication devices are fitted, these should not be viewed directly. Optical power meters should be used to determine the operation or signal level of the device.

Older Products

Electrical adjustments

Equipments which require direct physical adjustments to their operating mechanism to change current or voltage settings, should have the electrical power removed before making the change, to avoid any risk of electric shock.

Mechanical adjustments

The electrical power to the relay contacts should be removed before checking any mechanical settings, to avoid any risk of electric shock.

Draw out case relays

Removal of the cover on equipment incorporating electromechanical operating elements, may expose hazardous live parts such as relay contacts.

Insertion and withdrawal of extender cards

When using an extender card, this should not be inserted or withdrawn from the equipment whilst it is energised. This is to avoid possible shock or damage hazards. Hazardous live voltages may be accessible on the extender card.

Insertion and withdrawal of heavy current test plugs

When using a heavy current test plug, CT shorting links must be in place before insertion or removal, to avoid potentially lethal voltages.

Decommissioning and Disposal

Decommissioning: The auxiliary supply circuit in the relay may include capacitors across the supply or to earth. To avoid electric shock or energy hazards, after completely isolating the supplies to the relay (both poles of any dc supply), the capacitors should be safely discharged via the external terminals prior to decommissioning.

Disposal: It is recommended that incineration and disposal to water courses is avoided. The product should be disposed of in a safe manner. Any products containing batteries should have them removed before disposal, taking precautions to avoid short circuits. Particular regulations within the country of operation, may apply to the disposal of lithium batteries.

Technical Specifications

Protective fuse rating

The recommended maximum rating of the external protective fuse for this equipment is 16A, Red Spot type or equivalent, unless otherwise stated in the technical data section of the product documentation.

Insulation class:	IEC 61010-1: 1990/A2: 1995 Class I EN 61010-1: 1993/A2: 1995 Class I	This equipment requires a protective (safety) earth connection to ensure user safety.
Installation Category (Overvoltage):	IEC 61010-1: 1990/A2: 1995 Category III EN 61010-1: 1993/A2: 1995 Category III	Distribution level, fixed installation. Equipment in this category is qualification tested at 5kV peak, 1.2/50µs, 500Ω, 0.5J, between all supply circuits and earth and also between independent circuits.
Environment:	IEC 61010-1: 1990/A2: 1995 Pollution degree 2 EN 61010-1: 1993/A2: 1995 Pollution degree 2	Compliance is demonstrated by reference to generic safety standards.
Product safety: CE	73/23/EEC	Compliance with the European Commission Low Voltage Directive.
	EN 61010-1: 1993/A2: 1995 EN 60950: 1992/A11: 1997	Compliance is demonstrated by reference to generic safety standards.

Section 1. DESCRIPTION OF SETTINGS

1.1 Voltage settings

The setting voltage is determined by the positions of the six dual-in-line switches. The sum of all the voltages shown by each respective switch position and the constant value gives the required setting voltage. For example, an MVTI 11 with the switches set to the position shown corresponds to a setting of 32 + 26 = 58V ac.

	1	- - >	0	
Voltage	2	- - >	0	V_S = (32 + ∑) Volt
setting	2	< - -	0	= 32 + 2 + 8 + 16
switches	2	- - >	0	= 58V
	8	< - -	0	
	16	< - -	0	

For other versions the setting method is identical. Refer to the name plate on each individual relay.

Section 2. AUXILIARY EQUIPMENT

2.1 External series resistors

The following dropper resistors pre-mounted on an external assembly, marked with the relay serial number, are supplied with each relay when required. The serial numbers of the assemblies are listed below together with the resistor values.

2.2 MVTI 11 – Undervoltage

Relay ac rating (V) 50/60Hz	Relay dc rating (V)	Resistor assembly part number	Dropper resistor values fitted	
			dc series resistor (ohm) Rext 1	ac series resistor (ohm) Rext 2
100/200 57/120 57/70	30/34	Not required	–	–
380/440	30/34	ZE0103 020	–	66k
100/112 57/120 57/70	48/54	FJ0340 007	220R	–
380/440	48/54	ZE0103 021	220R	66k
100/120 57/120 57/70	110/125	FJ0340 001	1k0	–
380/440	110/125	ZE0103 022	1k0	66k
100/120 57/120 57/70	220/250	ZE0103 018	2 x 4k7 in parallel	–
380/440	220/250	ZE0103 023	2 x 4k7 in parallel	66k

2.3 MVTI 12 Overvoltage

Relay ac rating (V) 50/60Hz	Relay dc rating (V)	Resistor assembly part number	Dropper resistor values fitted	
			dc series resistor (ohm) Rext 1	ac series resistor (ohm) Rext 2
57/70 100/120 57/120	30/34	None required	–	–
380/440	30/34	ZE0103 020	–	66k
57/70 100/120 57/120	48/54	FJ0340 007	220R	–
380/440	48/54	ZE0103 021	220R	66k
57/70 100/120 57/70	110/125	FJ0340 001	1k0	–
380/440	110/125	ZE0103 022	1k0	66k
57/70 100/120 57/120	220/250	ZE0103 018	2 x 4k7 in parallel	–
57/70 380/440 57/120	220/250	ZE0103 023	2 x 4k7 in parallel	66k

The MVTI 12 is initially calibrated with this external resistor assembly and if the assembly or any of the resistors on it are changed, the relay must be recalibrated.

Section 3. INSTALLATION

3.1 Precautions

Protective relays, although generally of robust construction, require careful treatment prior to installation and a wise selection of site. By observing a few simple rules the possibility of premature failure is eliminated and a high degree of performance can be expected.

3.2 Packing

The relays are either despatched individually or as part of a panel/rack mounted assembly, in cartons specifically designed to protect them from damage.

3.3 Inspection

Relays should be examined immediately they are received to ensure that no damage has been sustained in transit. If damage due to rough handling is evident, a claim should be made immediately to the transport company concerned, and the nearest ALSTOM T&D Protection & Control Ltd representative should be promptly notified. Relays which are supplied unmounted and not intended for immediate installation should be returned to their protective polythene bags.

3.4 Unpacking

Care must be taken when unpacking and installing the relays so that none of the parts is damaged or their settings altered, and they must at all times be handled by skilled persons only.

Relays should be examined for any wedges, clamps or rubber bands necessary to secure moving parts to prevent damage during transit and these should be removed after installation and before commissioning.

Relays which have been removed from their cases should not be left in situations where they are exposed to dust or damp. This particularly applied to installations which are being carried out at the same time as constructional work.

3.5 Storage

If relays are not installed immediately upon receipt they should be stored in a place free from dust and moisture in their original cartons and where de-humidifier bags have been included in the packing they should be retained. The action of the de-humidifier crystals will be impaired if the bag has been exposed to humid conditions and may be restored by gently heating the bag for about an hour, prior to replacing it in the carton.

Dust which collects on a carton may, on subsequent unpacking, find its way into the relay; in damp conditions the carton and packing may become inpregnated with moisture and the de-humidifying agent will lose its efficiency.

Storage temperature –25°C to + 70°C.

3.6 Siting

The installation should be clean, dry and reasonably free from dust and excessive vibration. The site should preferably be well illuminated to facilitate inspection.

An outline diagram is normally supplied showing panel cut-outs and hole centres. For individually mounted relays these dimensions will also be found in Publication R6033.

Section 4. COMMISSIONING TESTS

CAUTION: Damage is likely to be incurred if the flag indicator/armature assembly of a miniature relay is actuated manually with a screwdriver/probe. Flags should always be reset with the cover in position by the facility provided.

4.1 Inspection and wiring check

Carefully examine the module and case to see that no damage has occurred during transit. Check that the serial numbers on the module, case, cover and resistor assembly (when an assembly is required) are identical and that the model number and rating information are correct.

Check that the external wiring is correct to the relevant relay diagram or scheme diagram. The relay diagram number appears inside the case. Particular attention should be paid to the wiring of the external resistors Rext 1 and Rext 2 to the relay (if required on scheme).

4.1.1 Electrostatic discharges (ESD)

The relay uses components which are sensitive to electrostatic discharges.
When handling the module, care should be taken to avoid contact with components and electrical connections. When removed from the case for storage, the module should be placed in an electrically conducting anti-static bag.
See full recommendations inside the front cover of this manual.

4.2 Connection of the MMLG test block

If an MMLG test block is provided, the connections should be checked to the scheme diagram, particularly that the supply connections are to the live side of the test block (coloured orange) – the odd numbered terminals. The auxiliary supply voltage to the scheme should be routed via the test block terminals 13 to 15. To facilitate ease of wiring the MMLG should be located at the right hand side of the assembly.

4.3 Earthing

Ensure that the case earthing connection above the rear terminal block is used to connect the relay to the local earth bar.

4.4 Insulation check

The relay and its associated wiring, may be insulation tested between:

– all electrically isolated circuits.

– all circuits and earth.

An electronic or brushless insulation tester should be used, having a dc voltage not exceeding 1kV. Accessible terminals of the same circuit should first be strapped together. Deliberate circuit earthing links, removed for the tests must subsequently be replaced.

4.5 Functional testing

Equipment required:

All versions

Variac transformer

DC voltmeter to check nominal dc volts

AC voltmeter to cover setting range

Resistance meter

AC ammeter 0-10mA

1 Double pole switch

1 Electronic timer

MVTI 11 & MVTI 12 380/440V versions only

Step-up transformer to cover setting range of 380/440V relay.

Note: Measuring accuracy depends on the accuracy of the instruments used.

4.5.1 DC auxiliary supply check

Ensure that the correct series dropping resistor(s) are fitted if required. Remove the relay from its case and check that the incoming dc supply at the relay case terminals 13 (positive ve) and 14 (negative ve) is within the range specified below:

Rated dc voltage (V)	DC operative range (V)
30/34	24 – 37.5
48/54	37.5 – 66
110/125	87.5 – 150
220/250	175 – 300

4.5.2 Test block type MMLG

If a test block is included in the scheme, it may also be associated with protection CT circuits. It is important that the sockets in the type MMLB 01 test plug, which correspond to the current transformer secondary windings are LINKED BEFORE THE TEST PLUG IS INSERTED INTO THE TEST BLOCK

DANGER: DO NOT OPEN CIRCUIT THE SECONDARY CIRCUIT OF A CURRENT TRANSFORMER SINCE THE HIGH VOLTAGE PRODUCED MAY BE LETHAL AND COULD DAMAGE INSULATION.

4.5.3 Voltage setting check

The pick-up and drop-off voltages of the relay should be measured with the voltage setting switches set to each of the positions shown in the table below.

1 = switch closed (left hand position)

0 = switch open (right hand position)

Table 1

Switch position		Pick-up voltage (V_{RMS})							
Switch	1 2 3 4 5 6	MVTI 11 57/70V	MVTI 11 57/120V	MVTI 11 100/120V	MVTI 11 380/440V	MVTI 12 100/120V	MVTI 12 380/440V	MVTI 12 57/70V	MVTI 12 57/120V
Test 1	0 0 0 0 0 0	32	20	62	210	105	400	60	62
Test 2	1 0 0 0 0 0	33	21.5	63.5	216	107.5	410	61.5	63.5
Test 3	0 1 0 0 0 0	34	23	65	222	110	420	63	65
Test 4	0 0 1 0 0 0	34	23	65	222	110	420	63	65
Test 5	0 0 0 1 0 0	34	23	65	222	110	420	63	65
Test 6	0 0 0 0 1 0	40	32	74	258	125	480	72	74
Test 7	1 1 1 1 1 1	63	66.5	108.5	396	182.5	710	106.5	108.5

When the switches have been set for each test, the cover should be replaced to ensure that the flag is always reset with the cover reset mechanism.

The relays should be connected as shown in the circuit diagram, Figures 1, 2 and 3.

MVTI 11 Undervoltage relay – see Figure 1.

The ac input voltage should be increased to a value above the setting value and the flag reset. Slowly decrease the input vltage until the relay picks up when the light-emitting diode (LED) illuminates. Record the pick-up.

Slowly increase the voltage checking to see when the relay drops off (when the LED indicator can be reset). This is the drop-off value and should be recorded.

Alternatively the pick-up and drop-off values can be determined using an ohmmeter connected across the contacts.

Repeat the test for each of the settings shown in Table 1.

The allowable errors on the voltage settings are ±2% on the lowest setting and ±4% on all other settings. (No allowance has been made for instrument errors). The drop-off value should be within 5% of the pick-up value.

MVTI 12 Overvoltage relay and MVTI 11 Undervoltage relay

See figures 1 and 2 for test circuits for the 57/70V, 57/120V, 100/120V and 380/440V versions respectively.

If the 380/440V version is being commissioned, a step-up transformer is needed to allow the calibration of the settings to be checked.

Check that the flag is reset and slowly increase the ac voltage until the flag illuminates. Record the pick-up value. Slowly lower the voltage to see when the flag can be reset. This is the drop-off value and should be recorded.

The allowable errors on the voltage settings are ±2% on the lowest setting and ±4% on all other settings. (No allowance has been made for instrument errors).

The drop-off value should be within 5% of the pick-up value.

Alternative test method for 380/440V versions of MVTI 12 and MVTI 11.

This method should be used only when no step-up transformer is available.

See Figure 3 for test circuit.

Firstly, measure accurately the resistance of the dropper resistor assembly (Rext 2).

With the relay on the lowest setting and the dropper resistor (Rext 2) removed from the circuit, measure the pick-up voltage directly at the relay terminals 27 and 28 and the ac current into the relay at the pick-up voltage. Use the following formula to calculate the effective pick-up voltage:

$V_{eff} = V_M + I_M R_M$ where

V_{eff} = effective pick-up voltage

V_M = measured pick-up voltage with Rext 2 out of circuit

I_M = measured pick-up current with Rext 2 out of circuit

R_M = measured resistance of Rext 2

The drop-off voltage can be found in the same way.

The pick-up voltage should be within ±2% of the lowest setting voltage.
No allowance has been made for instrument errors.

This test has checked the calibration point of the relay. The other relay settings need only be checked to see that they are functioning. Refer to tests 2 – 7 in Table 1 for the appropriate switch positions.

With the dropper resistors (Rext 2) still out of circuit, monitor the voltage at the relay terminals 27 and 28. slowly increase the voltage until the relay picks up and record the pick-up value. Slowly lower the voltage until the relay drops off and record the drop-off value.

If the pick-up voltage at the 400V setting is Z, the measured pick-up voltages at the other settings should be higher than the 400V setting by the amounts shown.

Test number	Setting voltage	Pick-up voltage at relay input Terminals (27 & 28)
1	400V	Z
2	410V	Z + 2V ± 1V
3, 4, 5	420V	Z + 4V ± 1V
6	480V	Z + 17V ± 2V
7	710V	Z + 66V ± 4V

4.5.4 Operation times

MVTI 11 (Undervoltage)

Connect the other pole of the switch to start the electronic timer (open to start mode) and one output contact to stop the timer. Set the volts at least 10% above the setting with the switch on. Switch off and record the time. The time will vary a little with the point on the sinewave when the switch is operated, therefore time a number of operations.

All times obtained should be less than 40 ms.

MVTI 12 (Overvoltage)

Connect the other pole of the switch to start the electronic timer (close to start mode) and one of the output contacts to stop the timer.

Switch on, set the volts to at least 20% above the setting, switch off. Close the switch and measure the operation time. The time will vary a little with the point on the sinewave when the switch is operated, therefore time a number of operations.
All times obtained should be less than 40 ms.

4.5.5 Final setting checks

Adjust the voltage setting to its functional setting and measure the pick-up and drop-off values as already mentioned. Check that they are within the stated tolerance.

4.5.6 LED flag and contact check

Check that the LED flag and reset pushbutton operate satisfactorily. Also check that the contacts operate by means of continuity checks.

4.5.7 Final checks

Operate the relay with the trip and alarm links restored to ensure that the trip and alarm circuits are energised according to the relevant schematic diagram.

Remove all test leads, test switches, temporary shorting leads etc.

Replace any links which have been removed to facilitate testing.

If a test plug (MMLB) and test block (MMLG) have been used, remove the test plug.

CAUTION: Replace the test block cover to put the protection in service.

Section 5. MAINTENANCE

Periodic maintenance is not necessary. However, periodic inspection and test is recommended.

5.1 Visual inspection

Isolate all supplies and withdraw the module from the case using the two black handles on the relay. Inspect the printed circuit board for any sign of loose components or connections.

Your attention is drawn to the fact that the relay can be damaged by electrostatic discharges. The pcb should not be touched unless precautions have been taken. See details at the front of this publication.

5.2 Functional checks

Periodic function tests should be carried out using the test procedures shown in the commissioning section.

Section 6. PROBLEM ANALYSIS

These instructions enable a fault to be localised to sub-assembly level. Fault finding to component level is not recommended. The main reasons for this are as follows:

- fault finding on printed circuit boards requires the use of specialised knowledge and equipment.
- components used in manufacture are subject to strict quality control and in certain cases selected for particular characteristics. Complementary metal oxide silicon (CMOS) components are used, which require extremely careful handling.
- damage can be caused to the printed circuit track unless extreme care is used in the replacement of components.
- replacements of some components will necessitate recalibration of the relay.

6.1 Test equipment required for fault finding

Equipment required for fault finding is minimal and consists of the following:

Digital multimeter with ranges of 0 – 1000V ac/dc and 0 – 1A ac/dc
DC voltage supply 30V 0.5A
AC voltage source 0 – 500V 50Hz @ 10mA
Relay tool kit

6.2 Inspection – removal of module from cases

Unscrew the two front cover screws and remove the clear plastic front cover
Ensure that the dc supply is isolated and then withdraw the module assembly by the two black handles. A quick inspection of the relay may result in the detection of obvious faults, i.e. loose components or connections. Otherwise proceed to the next section.

6.3 Connections for MVTI 11 and MVTI 12

The connections between the relay terminals and the rest of the system are listed below:

Terminal connections: Terminals 13 and 14 are connected to the positive and negative dc supply. Terminals 1 to 6 are the tripping outputs of the relay. Terminals 27 and 28 are the ac input.

6.4 Checking voltage supplies to module

The dc voltage ratings available are 30/34V, 48/54V, 110/125V and 220/250V. Where voltage sources which are higher than 30V are used, external dropper resistors are connected in series with the positive supply rail.

Check that the dc supply voltage is present and that the polarity is correct between terminals 13 and 14 on the relay case terminal block when the module is removed from the case. Note that when the module is in the case and the supply is connected, the voltage across the terminals may be less due to the voltage drop across the external dropper resistor R_D (if fitted).

Check that the ac is present between terminals 27 and 28. Check that for the 380/440V ac versions of the MVTI 11 and MVTI 12, the series resistors are fitted in series with the ac supply terminals.

6.5 Printed circuit board tests

If all the connections are intact and the supplies are of the correct voltage and polarity, it is likely that the fault will lie somewhere in the module. Proceed to the next two sections to try to confirm this.

6.5.1 Measurements of the dc operating currents of the modules

By monitoring the dc operating current of a module, a good indication is provided that the module is connected correctly and that the dc power supply section is operating correctly, if the current measured lies within about ±10% of the specified value. Allowances must be made for supply voltages deviating from the lower rated voltage as this has a significant effect on the dc burden.

These dc burden tests should be carried out in the operated and non-operated state – that is with the ac input both above and below the voltage setting level.

An ammeter should be connected in the positive supply line to measure these burdens. Typical values for the dc burdens are shown in the following tables for the MVTI 11 and MVTI 12.

Burdens: MVTI 11 Instantaneous Undervoltage Relay

Nominal voltage range (V)		30/34	48/54	110/125	220/250
Series dropper resistor R_D (ohm) Rext 1		None	220	1k	4k7 Parallel 4k7
DC voltage supplied for test (V)		30	48	110	240
	Relay on standby Vin > V setting	27	39	71	83
Current consumption (mA)	Relay output energised Vin < V setting	65	67	71	83

Burdens: MVTI 12 Instantaneous Overvoltage Relay

Nominal voltage range (V)		30/34	48/54	110/125	220/250
Series dropper resistor R_D (ohm) Rext 1		None	220	1k Parallel 4k7	4k7
DC voltage supplied for test (V)		30	48	110	240
Current consumption (mA)	Relay on standby Vin > V setting	27	39	71	83
	Relay output energised Vin < V setting	65	67	71	83

6.5.2 Measurement of the ac operating currents of the modules

Monitor the ac input current by connecting an ammeter in series with one input terminal and the source. This test should be done at the following input voltages:

63.5V on 57/70V and 57/120V versions of MVTI 11
110V on 100/120V version of MVTI 11 and MVTI 12
415V on 380/440V version of MVTI 11 and MVTI 12

The current through the transformer primary should be approximately 6mA.

If the measured current is zero, suspect an open circuit primary winding, series resistor or connection.

If the measured current exceeds 8mA, check that the external dropper resistors are correctly fitted (380/440V version only). Also check that the series resistor R11, fitted on the pcb is the correct value. If these are correctly fitted, then the primary windings may be shorted together.

6.6 Repairs and replacements

The instructions given enable the detection of faults to sub-assembly level. If it is believed that the module is faulty ALSTOM T&D Protection & Control Ltd should be contacted, quoting the relay module number and serial number.

6.7 Calibration information

All relays are supplied precalibrated. The 380/440V ac versions of the MVTI 11 and MVTI 12 are calibrated with the external series dropper resistors, Rext 2, fitted on the resistor assembly supplied with the module. If any external ac series resistor or the printed circuit board assembly itself is exchanged, the relay will require recalibration. The dc series dropper resistor Rext 1 may be exchanged without affecting the relay calibration. It is recommended that the re-calibration of a module is undertaken by ALSTOM T&D Protection & Control Ltd.

6.8 Replacement parts – ordering information

When ordering any spares, please quote the relay model number and serial number as well as the printed circuit board part number.

Repairs

Should the need arise for the equipment to be returned to ALSTOM T&D Protection & Control Ltd for repair or re-calibration, then the form at the back of this manual should be completed and sent with the equipment together with a copy of any commissioning test results.

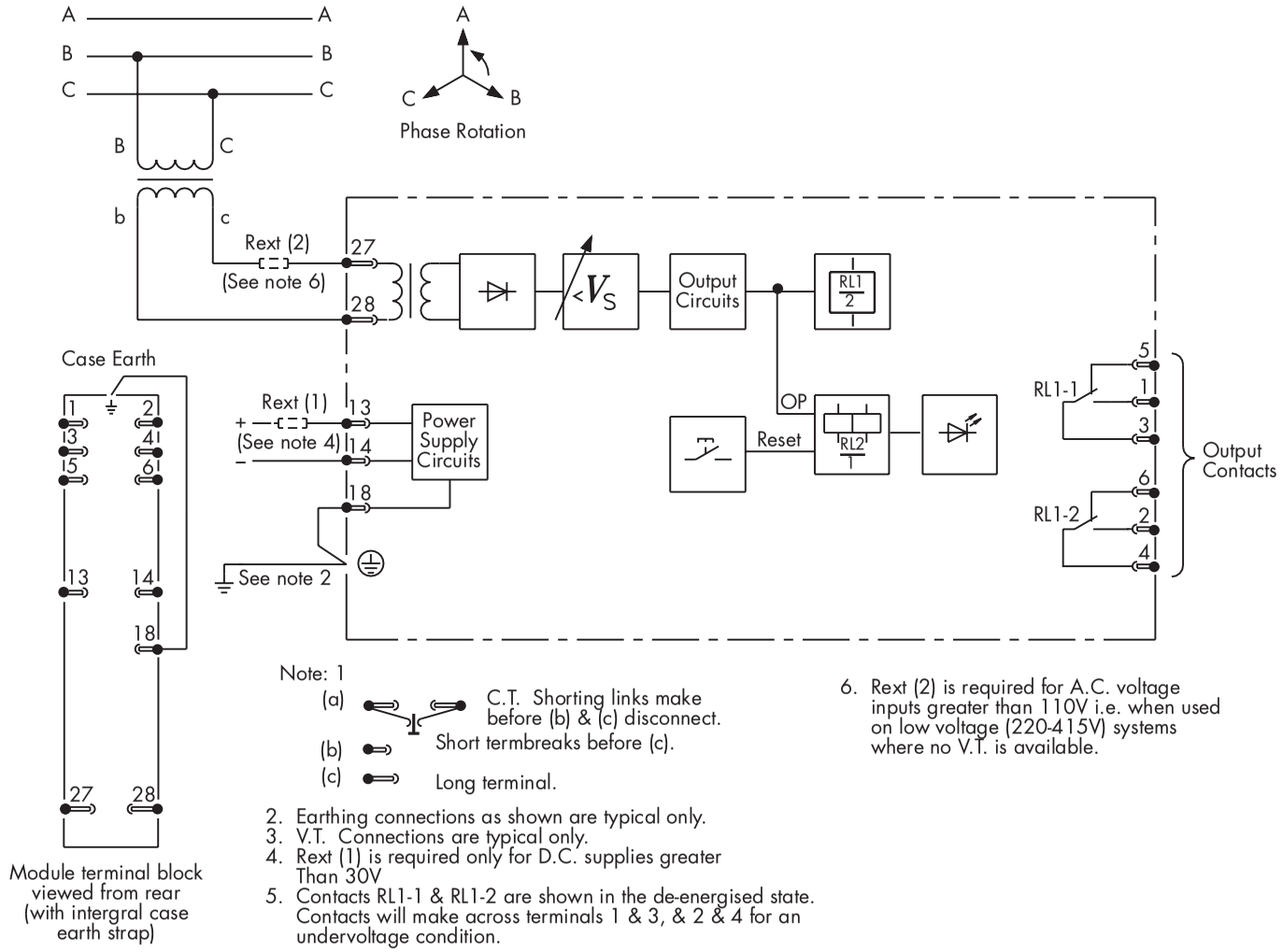

Figure 1 Application diagram: Static modular instantaneous overvoltage relay – Type MVTI 11

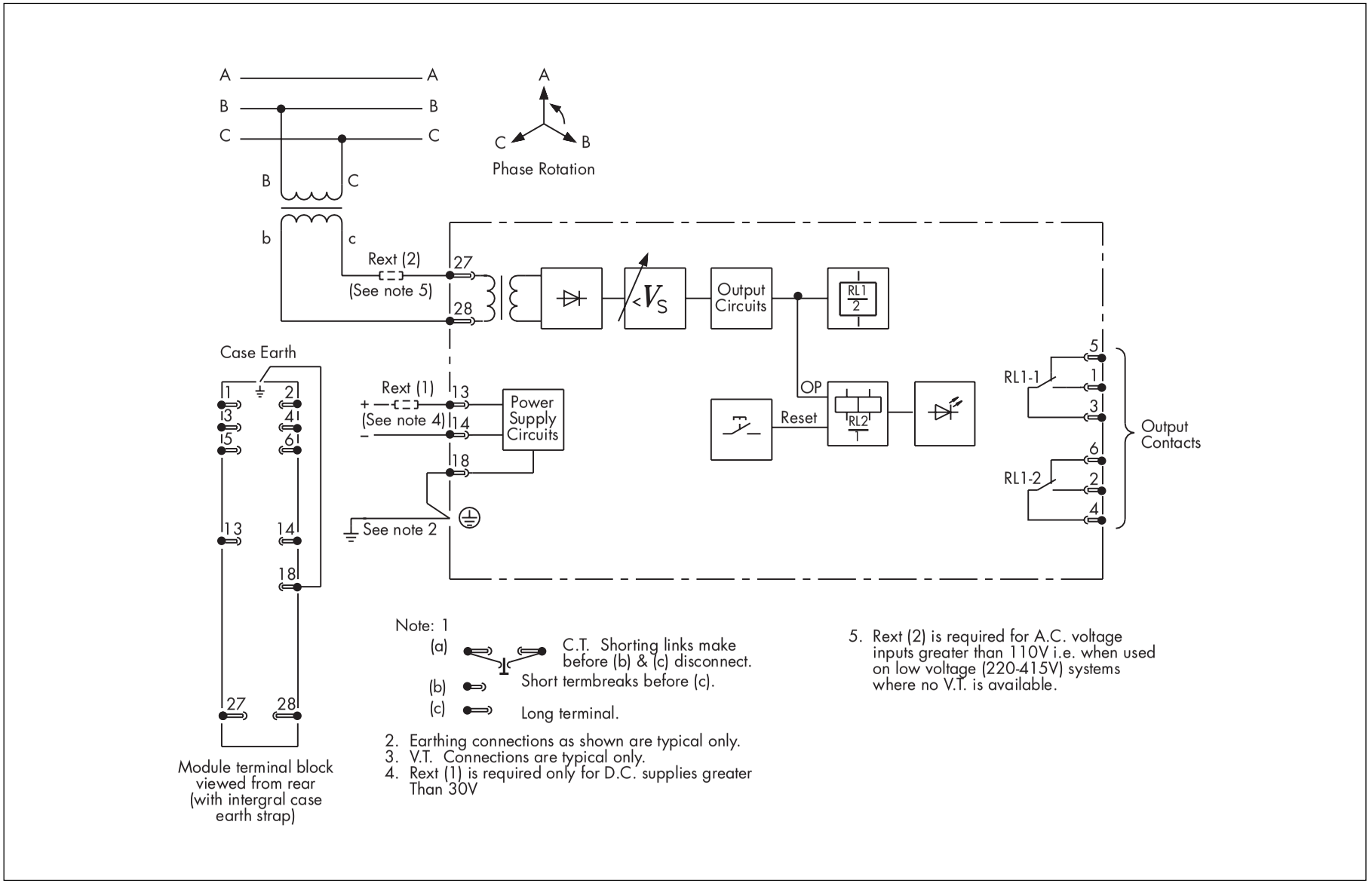

Figure 2 Application diagram: Static modular instantaneous overvoltage relay – Type MVTI 12

Section 7. COMMISSIONING TEST RECORD

Instantaneous Voltage Relay Type MVTI

Date _____

Station _____ Circuit _____

Relay model No. MVTI _____ Serial No _____

Rated AC voltage V_n | |

Rext 2 (if required) | |

DC Auxiliary voltage (Vx) | |

Rext 1 (if required) | |

Nominal voltage setting | |

Actual pick-up value | |

Actual drop-off value | |

Operation times | | | | | | ms

Contacts checked

Terminals 1 – 3 | | 3 – 5 | |

2 – 4 | | 4 – 6 | |

_____ _____

Commissioning Engineer Customer Witness

_____ _____

Date Date

REPAIR FORM

Please complete this form and return it to ALSTOM T&D Protection & Control Ltd with the equipment to be repaired. This form may also be used in the case of application queries.

ALSTOM T&D Protection & Control Ltd
St. Leonards Works
Stafford
ST17 4LX,
England

For: After Sales Service Department

Customer Ref: _____ Model No: _____

ALSTOM Contract Ref: _____ Serial No: _____

Date: _____

1. What parameters were in use at the time the fault occurred?

   AC volts _____ Main VT/Test set

   DC volts _____ Battery/Power supply

   AC current _____ Main CT/Test set

   Frequency _____

2. Which type of test was being used? _____

3. Were all the external components fitted where required? Yes/No
   (Delete as appropriate.)

4. List the relay settings being used

   _____

   _____

   _____

5. What did you expect to happen?

   _____

   _____

   _____

   _____

continued overleaf

6. What did happen?

_____

_____

_____

_____

7. When did the fault occur?

Instant Yes/No Intermittent Yes/No

Time delayed Yes/No (Delete as appropriate).

By how long? _____

8. What indications if any did the relay show?

_____

_____

_____

9. Was there any visual damage?

_____

_____

_____

10. Any other remarks which may be useful:

_____

_____

_____

_____ _____

Signature Title

_____ _____

Name (in capitals) Company name

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Tel: 44 (0) 1785 223251 Fax: 44 (0) 1785 212232 Email: pcs.enquiries@tde.alstom.com Internet: www.alstom.com

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Our policy is one of continuous product development and the right is reserved to supply equipment which may vary from that described.

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